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A new species of *Gilpinia* Benson (Hymenoptera, Diprionidae) from Lishui, China

Ze-Jian Li[1], Han-Nan Wang[2], Meng-Meng Liu[3], Mei-Cai Wei[4]

1 *Provincial postdoctoral Research Station, Scientific Research and Management Center of East China Medicinal Botanical Garden, Lishui Ecological Forestry Development Center, Lishui, Zhejiang 323000, China* **2** *Lab of Insect Systematics and Evolutionary Biology, Central South University of Forestry and Technology, Changsha, Hunan 410004, China* **3** *College of Ecology, Lishui University, Lishui, Zhejiang 323000, China* **4** *College of Life Science, Jiangxi Normal University, Nanchang, Jiangxi 330022, China*

Corresponding author: Mei-Cai Wei (weimc@126.com)

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Abstract

Gilpinia was established by Benson (1939). In this paper, a new species of *Gilpinia lishui* Li, Wang & Wei, **sp. nov.** (Hymenoptera: Diprionidae) from Lishui, Zhejiang Province, China is described. A key to Chinese species of *Gilpinia* is provided.

Keywords

China, Diprioninae, key, sawflies, Symphyta, taxonomy

Introduction

Gilpinia Benson, 1939 is the second largest genus in Diprionidae including 38 world species and 15 Chinese species (Taeger et al. 2010; Hara and Nakamura 2015; Hara and Shinohara 2015; Wang et al. 2019). The previously known Chinese species were listed and keyed by Wang et al. (2019).

The village Dayuan, the type locality of the new species described below, is located in the town of Dayuan in Jinyun County of Lishui City, Zhejiang Province in East China. Five females were collected there and identified as new to science. A diagnosis and description of the new species as well as a revised key to the Chinese species of *Gilpinia* are reported herein.

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Materials and methods

Specimens studied in this work were collected near the village Dayuan by a light trap. The specimens were examined with a Motic-SMZ-171 stereomicroscope. Images of adults were taken with a Nikon D700 digital camera and a Leica Z16APO miscroscope. The genitalia were examined with a Motic BA410E microscope and photographed with a Motic Moticam Pro 285A. Images were focus-stacked using Helicon Focus (HeliconSoft, Kharkiv, Ukraine) and further processed with Adobe Photoshop CS 11.0. The terminology of genitalia follows Ross (1945) and that of general morphology follows Viitasaari (2002). For a few terms (e.g., middle fovea and lateral fovea), we follow Takeuchi (1952).

The holotype and a paratype are deposited in the Asian Sawfly Museum, Nanchang, China (**ASMN**). The remaining paratypes are deposited in the Scientific Research and Management Center of East China Pharmaceutical Botanical Garden, Lishui, Zhejiang, China (formerly Lishui Academy of Forestry, **LSAF**). Specimens of other species examined in this research are deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C., USA (**USNM**), and National Museum of Nature and Science, Ibaraki, Japan (**NSMT**). We have examined examples of the following species: *G. baiyinaobaoa* G. Xiao and X. Huang (NSMT), *G. fennica* (Forsius) (USNM), *G. hebedentata* Xu (ASMN), *G. infuscalae* Wang and Wei (ASMN, USMN), *G. jingxii* Xiao and Huang (USNM), *G. lishui* Li, Wang and Wei (ASMN, LSAF), *G. lipuensis* Xiao and Huang (ASMN, USNM), *G. marshalli* (Forsius) (USNM), *G. masoniana* Xiao (USNM), *G. tabulaeformis* Xiao (ASMN, USNM), *G. yongrenica* Xiao and Huang (USNM), *G. virens* (Klug) (ASMN, USNM).

Abbreviations used in the text and illustrations are as follows:

OCL The distance between a lateral ocellus and the occipital carina, or the hind margin of the head where this carina would be if it was developed (Benson 1954);
OOL The distance between an eye and a lateral ocellus;
POL The distance between the mesal margins of the 2 lateral ocelli.

Results

Taxonomy

Genus *Gilpinia* Benson, 1939

Gilpinia Benson, 1939: 341.

Type species. *Lophyrus polytomus* Hartig, by original designation.

Diagnosis. See Wang et al. (2019) for the diagnosis and character assessment of the genus.

***Gilpinia lishui* Li, Wang & Wei, sp. nov.**
http://zoobank.org/CE900234-517E-4901-A99E-B168EC874921
Figs 1–12

Type locality. China, Zhejiang, Lishui City, Jinyun County, Dayuan Town, Dayuan Village.

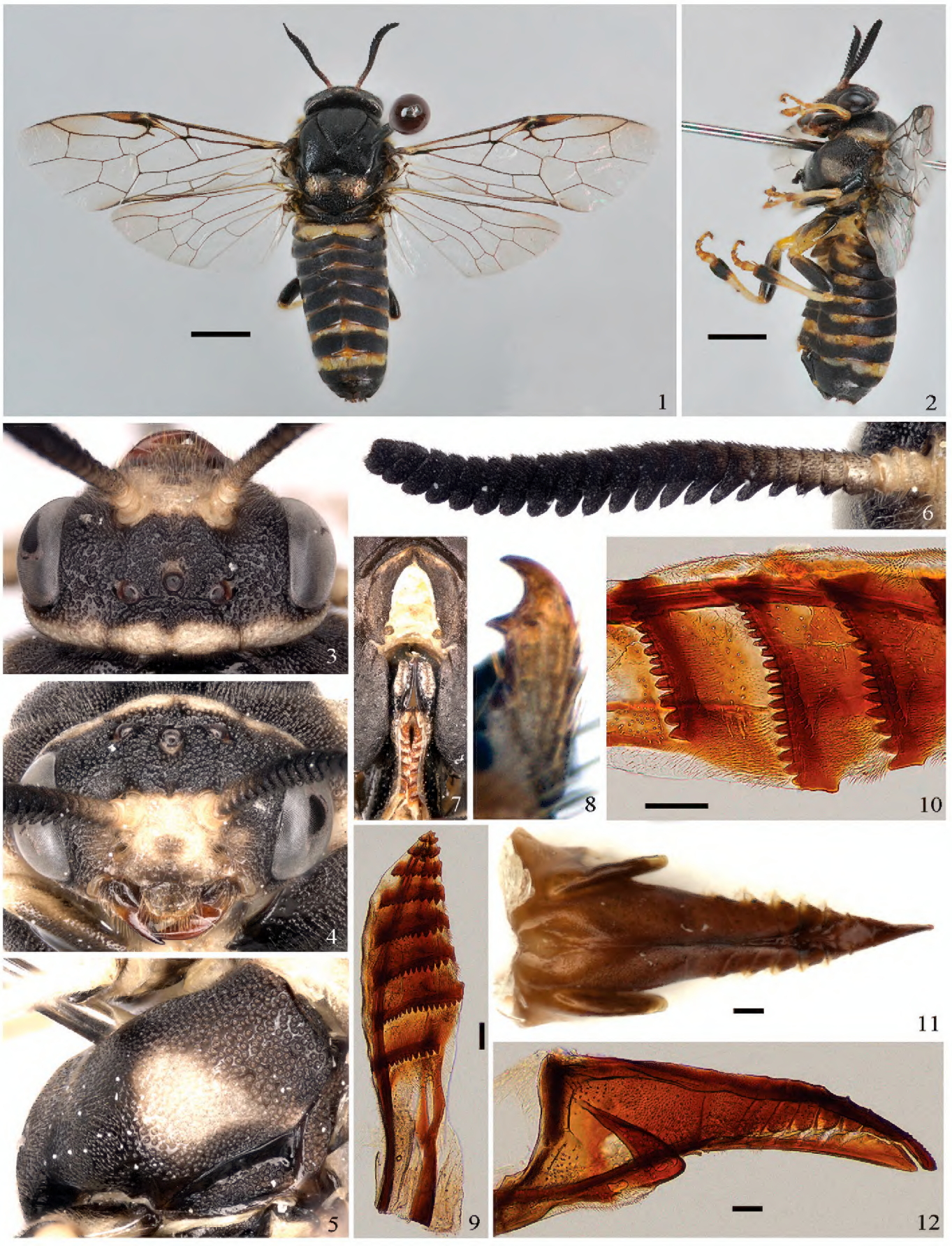
Type material examined. ***Holotype*,** female, China: Zhejiang Province, Lishui City, Jinyun County, Dayuan Town, Dayuan Village, 28.612°N, 120. 309°E, alt. 273 m, 10 August 2021, leg. Ze-Jian Li, alcohol (LSAF21043). ***Paratypes*,** 4 females, same data as holotype.

Diagnosis. The genus *Gilpinia* is similar to *Macrodiprion* in most external morphology characters, but there are clear differences in lancet structures. This new species resembles *G. tohi* Takeuchi, 1940 in external morphology and lancet characters together, but differs from the latter by the following characters: Lancet with 9 annuli (Fig. 9), annulus 1 about 1.2–1.3× the length of annulus 2 at middle, the first annulus weakly curved and distinctly oblique (Fig. 10), distance between the lower end of the second annulus and apex of lancet about 1.6× the height of the second annulus as measure perpendicular to the longitudinal axis of the lancet (Fig. 9), the serrulae 2–6 flat (Fig. 9); posterior margin of head and supraclypeal area white (Fig. 3), labrum yellow brown, clypeus black except for lateral corners white (Fig. 4); abdomen black, the first tergum largely white, the following 4 terga black with small lateral white maculae (Figs 1–2). *G. lishui* sp. nov. differs from *Macrodiprion wui* Xu, 1997, possibly a species of *Gilpinia*, by the posterior margin of head and supraclypeal area white; the apical half of pterostigma pale brown; the basal 7 flagellomeres yellow brown; the lancet with 9 annuli, the distance between the lower end of the second annulus and the apex of lancet 1.6 times the height of second annulus.

Description. Holotype, female. Body length 10–10.5 mm, wingspan 19–20 mm (Figs 1–2).

Color. Body largely black, following parts yellowish white: supraclypeal area and toruli (Fig. 4), scape and pedicel (Fig. 6), apical 3/5 of postocellar area, posterior half of temple and of hind orbit (Fig. 3), a large triangular macula on mesepisternum (Fig. 5) and two large lateral maculae on mesoscutellum (Fig. 1), abdominal tergum 1 largely, anterolateral stripe on recurved portions of terga 2–4, narrow anterior band wider laterally on terga 5–8, posterior margin of tergum 10, anterior 4/7 of sterna 3–7; mandibles reddish brown with black base; palp and labrum brown; narrow base of clypeus and dorsum of flagellomeres 1–7 pale brown; legs yellowish white, following parts black: fore coxa except for apex, middle and hind coxae except for apex and lateral macula, most of fore coxa, each femur except for dorsal stripe, apical 1/3 of hind tibia; apex of fore and middle tibiae and of each tarsomere brown. Wings hyaline, apex of cell R1 and posterior margin of fore wing infuscate, basal 2/5 and narrow margins of stigma black, apical 2/3 of stigma, veins R1 and most of vein A whitish, vein C pale brown, other veins blackish brown. (Figs 1–2)

Punctation. Head and thorax densely punctured, miscrosculpture smooth, shiny, except as follows: labrum, temple, anterior part of clypeus and of supraclypeal area



Figures 1–12. *Gilpinia lishui* sp. nov., female, holotype **1** female adult, dorsal view **2** female adult, lateral view **3** head of female, dorsal view **4** head of female, anterior view **5** mesopleuron and metapleuron of female **6** antenna of female, lateral view **7** ovipositor sheath, ventral view **8** claw of hind leg, lateral view **9** lancet **10** the 1–3 annuli of lancet **11** lance, dorsal view **12** lance, lateral view. Scale bars: 2 mm (**1, 2**); 100 μm (**9–12**).

sparsely punctured, anterior part of parapsis, lower posterior corner of mesepisternum, anterior third and narrow posterior margin of mesepimeron smooth and strongly shiny; metapleuron and bottom of parapsis weakly striate microsculptured; abdomen strongly and densely striate microsculptured, almost matte, ovipositor sheath largely smooth and shiny.

Head. Hairs on dorsum of head slightly shorter than diameter of median ocellus, curved at apex; hairs on mesonotum very short and erect, and on mesopleuron very short. Anterior margin of clypeus shallowly and broadly incised, malar space as long as diameter of median ocellus, middle fovea distinct, distance between eye and torulus approximately 1.3× distance between toruli (Fig. 4), postocellar area elevated with a shallow median furrow, approximately 2.5× as broad as long, postocellar furrow clear, POL : OOL : OCL = 61 : 48 : 40 (Fig. 3). Antenna serrate with 22 distinct antennomeres, apex of terminal flagellomere obtuse and truncate, scape approximately 1.3× as broad as long, pedicel approximately 0.5× as broad ad long, antennomere 1 slightly broader than long, other antennomeres distinctly broader than long, ventral teeth of middle antennomeres clearly shorter than apical breadth of each antennomere (Fig. 6).

Thorax. Anterior margin of mesoscutellum almost truncate, slightly convex at middle, anterior margin of mesoscutellum approximately 1.5× as broad as long; distance between cenchri equal to length of a cenchrus.

Abdomen. Ovipositor sheath in ventral view shown in Fig. 7; middle lobe of sternum 7 narrowly and deeply incised at middle, posterior margin of sternum 7 deeply incised submedially. Inner apical spur of hind tibia simple and approximately 0.8× length of tarsomere 1; subapical tooth of claw short and remote from apical tooth (Fig. 8). Lancet with 9 distinct annuli, weakly narrowing from annulus 2 to 5 and then abruptly narrowed toward apex (Fig. 9); annulus 1 without serrula, about 1.2–1.3× length of annulus 2 at middle, weakly curved and oblique, subparallel with annulus 2, distance between lower end of annulus 2 and apex of lancet about 1.6× height of annulus 2 (Fig. 9); basal 1–3 annuli as shown in Fig. 10, serrulae of annuli 2–6 flat, width of annulus 2 approximately 1.15× width of annulus 3; lance in dorsal view as shown in Fig. 11, auricular process large and triangular; lance in lateral view as shown in Fig. 12.

Male. Unknown.

Variety. In one specimen, the mesoscutellum has a uniformly white band with two lateral yellowish white maculae connected.

Host plants. Unknown.

Distribution. China (Zhejiang).

Etymology. The specific epithet "*lishui*" is derived from the type locality, Lishui City, Zhejiang Province of East China.

Key to the Chinese species of *Gilpinia* Benson (females; not examined species are marked with*)

1 Inner spur of hind tibia scale like **2**

– Inner spur of hind tibia simple **4**

2 Annuli 2 and 3 divergent downwards (Fig. 14); pronotum entirely yellow; only posterior margin of mesoscutellum black. China (Heilongjiang), Finland ..... ***G. fennica* (Forsius, 1911)**

– Annuli 2 and 3 parallel (Figs 13, 15); pronotum yellow with black marks; both anterior and posterior margins of mesoscutellum black **3**

3 Serrulae 3–5 broader than their respective ctenidia (Fig. 13); head with a transverse dark band on ocellar area, not reaching inner margins of eyes; apical margin of clypeus straight; ocellar area with 3 small brownish marks; pronotum pale with anterior margin black. China (Inner Mongolia) ..... ***G. baiyinaobaoa*** **G. Xiao & X. Huang, 1985**

– Serrulae 3–5 equal in breadth to their respective ctenidia (Fig. 15); head with a transverse dark band on ocellar area, reaching inner margins of eyes; apical margin of clypeus slightly incised; ocellar area without brownish marks; pronotum black with lateral corners pale. China (Heilongjiang, Jilin), Siberia, Europe..... ..... ***G. virens*** **(Klug, 1812)**

4 Wings strongly smoky; body entirely black in both sexes without pale markings; basal two ctenidia inclined apically, second annulus more than 2× as broad as first annulus, lamnium triangular, widest near second annulus and strongly tapering toward apex (Fig. 20). China (Jiangxi)..... ..... ***G. infuscalae*** **Wang & Wei, 2019**

– Wings hyaline; body at least partly pale; second ctenidium usually inclined basally, if perpendicular then lamnium not enlarged at middle; second annulus about as long as and at most slightly longer than first annulus **5**

5 Head largely black at least between ocellar area and toruli; lancet weakly broadened at middle, and weakly narrowed toward both ends, ventral margin of lamnium straight or nearly so; distance between lower end of second annulus and apex of lancet 1.6–2.5 times the height of second annulus as measure perpendicular to the longitudinal axis of the lancet..... **6**

– Head pale with a small black macula at most on ocellar area; lancet strongly narrowed from 2nd annulus both to base and apex, ventral margin of lamnium distinctly concave, distance between lower end of second annulus and apex of lancet 1.3–1.6× the height of second annulus as measure perpendicular to the longitudinal axis of the lancet **11**

6 First ctenidium strongly curved and strongly divergent downwards from second ctenidium 7

– First ctenidium straight or slightly curved and subparallel or even convergent downwards towards second ctenidium **8**

7 OOL slightly longer than POL (OOL : POL = 12 : 11); scape, pedicel and flagellomere 1 black and each basally pale; lateral mesoscutal lobe black with anterior and lateral margins pale; mesoscutellum pale with a central longitudinal black line; mesopleuron black with upper half of mesepisternum pale; annuli 4 and 5 parallel (Fig. 17). China (Sichuan, Yunnan) .... ***G. yongrenica*** **G. Xiao & X. Huang, 1984**

– OOL much shorter than POL; scape pale, flagellomere 1 black; lateral mesoscutal lobe black with lateral margins pale; mesoscutellum pale with posterior margin black, mesopleuron entirely yellow; annuli 4 and 5 distinctly divergent

downwards (Fig. 18). China (Heilongjiang) ..... **G. pinicola* G. Xiao & X. Huang, 1985**

8 Black macula on frons laterally not touching eye; first ctenidium weakly apically curved at middle; distance between lower end of second annulus and apex of lancet 2× the height of second annulus. China (Fujian), Thailand ..... ***G. marshalli* (Forsius, 1931)**

– Black macula on frons laterally touching eye or head almost entirely black; first ctenidium straight or weakly basally curved at middle; distance between lower end of second annulus and apex of lancet 1.6–2.5× the height of second annulus **9**

9 Mesoscutal median and lateral lobes entirely black; second trochanters white; lancet with 9 annuli **10**

– Mesoscutal median lobe with distinct pale lateral maculae; head black with labrum, clypeus, supraclypeal area and dorsal margin of head pale, trochanters black; lancet narrow with 10 annuli, annulus 1 about 1.0–1.1× length of annulus 2 and both oblique, annuli 2 and 3 parallel, distance between lower end of annulus 2 and apex of lancet about 2× the height of second annulus. China (Anhui) ..... ***G. massoniana* G. Xiao, 1992**

10 Lancet with annulus 1 about 0.7× length of annulus 2 and both perpendicular, distance between lower end of second annulus and apex of lancet about 2.3× height of second annulus as measure perpendicular to the longitudinal axis of the lancet, serrulae 2–5 with distinct teeth (Fig. 19); head black with labrum and ventral margin of clypeus yellow; abdomen yellowish brown, basal 5 terga dark brown; China (Heilongjiang), Japan (Hokkaido)* ***G. tohi* Takeuchi, 1940**

– Lancet with annulus 1 about 1.2–1.3× length of annulus 2 at middle, first annulus weakly curved and distinctly oblique, distance between lower end of second annulus and apex of lancet about 1.6× the height of second annulus as measure perpendicular to the longitudinal axis of the lancet, serrulae 2–6 flat (Fig. 26); posterior margin of head and supraclypeal area white, labrum yellow brown, clypeus black except for lateral corners; abdomen black, first tergum largely white, following 4 terga black with small lateral white maculae. Zhejiang ..... ***G. lishui* Li, Wang & Wei, sp. nov.**

11 Annulus 1 with a distinct serrula (Fig. 21) **12**

– Annulus 1 without serrula (Figs 22–25) **13**

12 Body reddish brown; ocellar area with a short dark transverse band; mesoscutellum, central part of pronotum and most of lateral mesoscutal lobe black (median mesoscutal lobe sometimes with black triangular mark); tergum 1 black. Lancet in Fig. 21. China (Gansu) ..... ***G. tabulaeformis* G. Xiao, 1992**

– Body yellowish brown; ocellar area pale without black marks; pronotum, median mesoscutal lobe, lateral mesoscutal lobe and tergum 1 pale; mesoscutellum black. China (Hebei) ..... ****G. funingensis* Wen, Sun & Li, 1991**

13 Ctenidium 1 broken at middle (Fig. 25); lateral mesoscutal lobe entirely pale. China (Anhui, Guangxi) ..... ***G. lipuensis* G. Xiao & X. Huang, 1985**

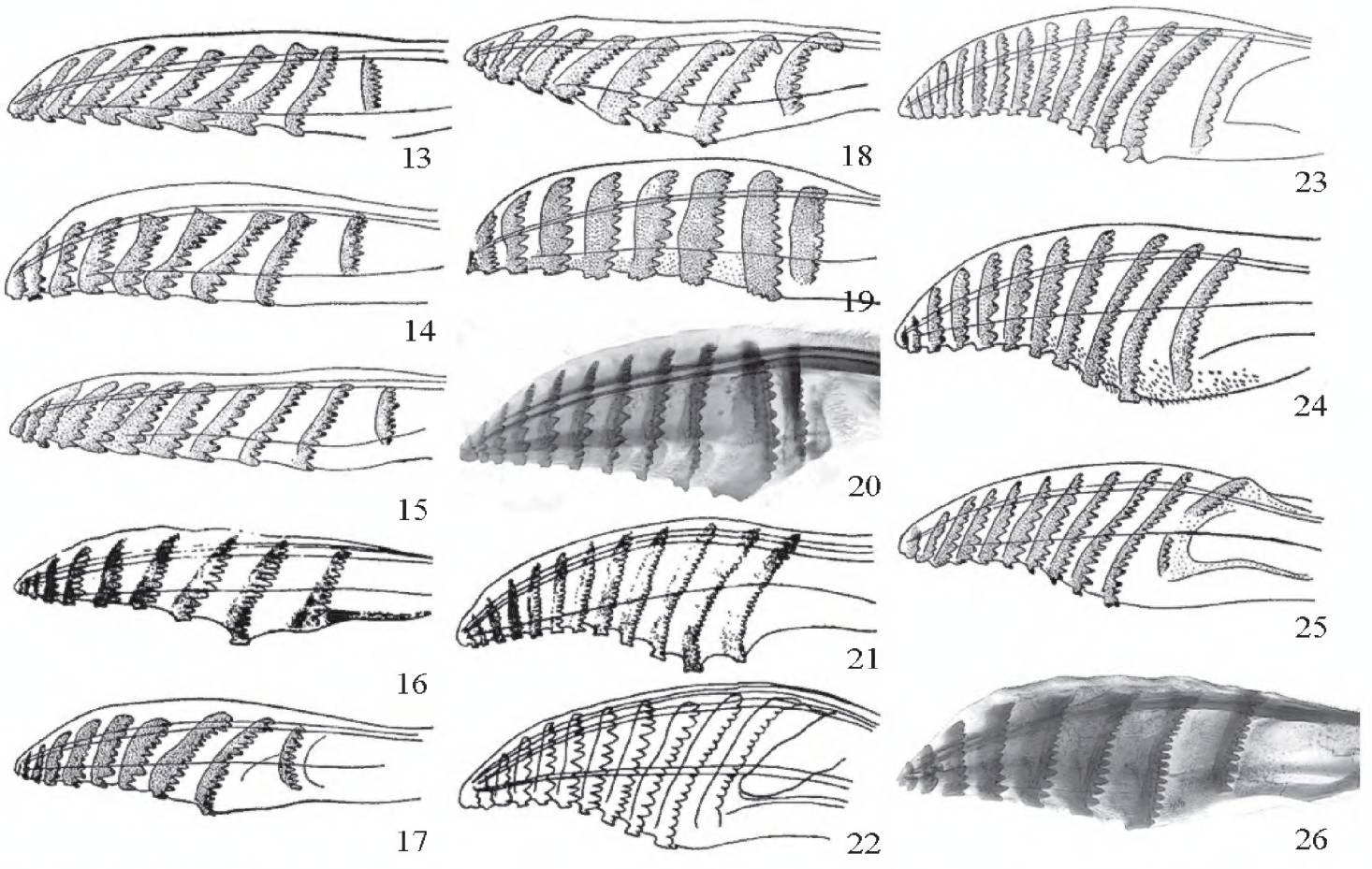
– Ctenidium 1 entire; lateral mesoscutal lobe pale with dark marks or entirely black **14**

14 Annuli 1 and 2 straight and parallel (Fig. 22); body yellow; mesoscutellum entirely pale; sheath with slender scopae close to each other. China (Yunnan)..... ..... ***G. hebedentata* Xu, 1997**

– Annuli 1 and 2 curved and divergent downwards (Figs 23, 24); body reddish brown, mesoscutellum entirely black or pale with posterior margin black; sheath with broad scopae not close to each other **15**

15 Annuli 1 and 2 distinctly divergent ventrally, basal serrulae acute (Fig. 23); labrum black; flagellomeres dorsally reddish brown, ventrally black; dorsal mesonotum mostly pale, median mesoscutal lobe pale, lateral mesoscutal lobe with central longitudinal dark stripe; mesoscutellum with posterior margin black. China (Yunnan) .....****G. jinghongensis* G. Xiao & X. Huang, 1984**

– Annuli 1 and 2 weakly divergent ventrally, basal serrulae truncate (Fig. 24); labrum reddish brown; flagellomeres black; dorsal mesonotum mostly black; median mesoscutal lobe with posterior dark mark; lateral mesoscutal lobe and mesoscutellum entirely black. China (Yunnan, Guizhou)..... ..... ***G. jingxii* G. Xiao & X. Huang, 1984**



Figures 13–26. Lancets **13** *Gilpinia baiyinaobaoa* **14** *G. fennica* **15** *G. virens* **16** *G. massoniana* **17** *G. yongrenica* **18** *G. pinicola* **19** *G. tohi* **20** *G. infuscalae* **21** *G. tabulaeformis* **22** *G. hebedentata* **23** *G. jinghongensis* **24** *G. jingxii* **25** *G. lipuensis* **26** *G. lishui* **13–19, 21–25** drawings of lancet by Xiao (1992), Xiao et al. (1992) and Xu (1997) **20** Photo by HNW (2019) **26** Photo by ZJL.

Discussion

Sixteen species of *Gilpinia*, including the new species have been recorded in China. We believe that more undescribed species of the genus have yet to be found from Central and Southern China. *G. lishui* is unusual among species of the genus in that its antennae are distinctly broadened at the middle and blunt at the apex. The antennae the new species are similar in this regard to species of *Macrodiprion*. However, we place the new species in *Gilpinia* due to the cenchri being close together and longer than the middle length of the metascutellum, and because the lancet is typical in structure for *Gilpinia*. *Macrodiprion wui* Xu (1997) is probably also a species of *Gilpinia* as the antennae, cenchri and lancet are all similar to those of *G. lishui*. *Gilpinia wui* Wang & Wei, 2019 has a possible problem with the homonym. A new name may need to be proposed in the subsequent study.

Collection of the new species by light trap was photographed by Zejian Li (Fig. 27) and a live specimen was photographed by Junfeng Wang (Fig. 28). The Village Dayuan

Figure 27. Photograph of light trap used to collect the new species, by Ze-Jian Li (10 August 2021).

Figure 28. Habitus photograph of the new species by Jun-Feng Wang (10 August 2021).

is apparently a suitable habitat for collecting sawflies, with an elevation of about 300 m above sea level. At present, we are not sure that Dayuan represents a unique habitat in Lishui City to species of Diprionidae.

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